

WHAT IS CLAIMED IS:

- 1        1.     A method for implementing a workflow comprised of nodes, comprising:
  - 2           generating a workflow packet accessed by users at the nodes in the workflow;
  - 3           receiving a request to add one target object in one of a plurality of data stores to
  - 4        the workflow packet, wherein each data store includes multiple objects;
  - 5           determining a first object identifier of the target object that is used to identify the
  - 6        target object in one data store;
  - 7           generating a second object identifier indicating the data store including the target
  - 8        object and the first object identifier; and
  - 9           inserting the generated second object identifier into the workflow packet, where
  - 10      nodes accessing objects in the workflow packet use the second object identifier to access
  - 11      the target object for use at the node.
- 1        2.     The method of claim 1, wherein the data stores are capable of being
- 2        different types of data stores and from different vendors.
- 1        3.     A method of performing an Input/Output (I/O) operation on an object
- 2        during execution of a workflow comprised of nodes, comprising:
  - 3           providing a plurality of objects stored in one of multiple data stores, wherein each
  - 4        object is identified within the data store with a first object identifier;
  - 5           providing a workflow packet referencing at least one object with a second object
  - 6        identifier, wherein the second object identifier indicates one of the data stores and the
  - 7        first object identifier of the referenced object in the data store;
  - 8           receiving, from one node, an I/O request for one target object referenced by one
  - 9        second object identifier in the workflow packet;
  - 10          determining from the second object identifier the data store of the target object
  - 11          and the first object identifier of the target object; and

12 performing the I/O request on the target object at the determined first object  
13 identifier in the determined data store.

1 4. The method of claim 3, wherein one workflow packet is associated with a  
2 plurality of the nodes in the workflow, and wherein the nodes submit I/O requests for one  
3 or more objects referenced by the second object identifiers in the workflow packet.

1 5. The method of claim 1, wherein the data stores are capable of being  
2 different types of data stores and from different vendors

1 6. The method of claim 3, further comprising:  
2 defining at least one work item for each node including a reference to the  
3 workflow packet, wherein the work item includes actions to perform with respect to at  
4 least one object in one data store referenced in the workflow packet; and  
5 receiving I/O requests from multiple nodes for objects referenced by second object  
6 identifiers in the workflow packet.

1 7. The method of claim 3, wherein the I/O request comprises a workflow I/O  
2 request, wherein each data store is accessed using data store interfaces, further  
3 comprising:

4 providing a mapping of workflow I/O requests to the data store interfaces for each  
5 of the data stores, wherein each workflow I/O request maps to one or more data store  
6 interfaces for each data store, wherein the data store interfaces implement the workflow  
7 I/O requests in the data store; and

8 determining from the mapping the at least one data store interface for the  
9 determined data store that implements the workflow I/O request in the determined data  
10 store, wherein the workflow I/O request is performed using the determined at least one  
11 data store interface.

1        8.     The method of claim 7, wherein the data stores are capable of comprising  
2 different types of data stores from different vendors that utilize different sets of data store  
3 interfaces to enable access to objects in the data stores, and wherein the mapping enables  
4 the workflow I/O requests to be executed across heterogeneous data stores.

1        9.     The method of claim 3, wherein the objects in the data store are capable of  
2 comprising documents, video files, audio files, and images.

1        10.    The method of claim 3, further comprising:  
2            receiving a request, from at least one node, to add one second object identifier to  
3 the workflow packet referencing one object in one of the data stores that is not already  
4 referenced in the workflow packet, wherein subsequent nodes in the workflow are  
5 capable of accessing the object referenced by the added second object identifier.

1        11.    The method of claim 3, further comprising:  
2            receiving a request, from at least one node, to remove one second object identifier  
3 in the workflow packet referencing one object in one of the data stores, wherein  
4 subsequent nodes in the workflow will not be capable of accessing the object referenced  
5 by the removed second object identifier.

1        12.    The method of claim 3, wherein the I/O request comprises a request to  
2 perform one of reading, writing or opening to the target object.

1        13.    A system for implementing a workflow comprised of nodes, comprising:  
2            a plurality of data stores, wherein each data store includes multiple objects;  
3            means for generating a workflow packet accessed by users at the nodes in the  
4 workflow;

5 means for receiving a request to add one target object in one of the data stores to  
6 the workflow packet;

7 means for determining a first object identifier of the target object that is used to  
8 identify the target object in one data store;

9 means for generating a second object identifier indicating the data store including  
10 the target object and the first object identifier; and

11 means for inserting the generated second object identifier into the workflow  
12 packet, where nodes accessing objects in the workflow packet use the second object  
13 identifier to access the target object for use at the node.

1 14. The system of claim 13, wherein the data stores are capable of being  
2 different types of data stores and from different vendors.

1 15. A system for performing an Input/Output (I/O) operation on an object  
2 during execution of a workflow comprised of nodes, comprising:

3 a plurality of data stores, wherein each data store includes a plurality of objects,  
4 and wherein each object is identified within the data store with a first object identifier;  
5 means for providing a workflow packet referencing at least one object with a  
6 second object identifier, wherein the second object identifier indicates one of the data  
7 stores and the first object identifier of the referenced object in the data store;

8 means for receiving, from one node, an I/O request for one target object  
9 referenced by one second object identifier in the workflow packet;

10 means for determining from the second object identifier the data store of the target  
11 object and the first object identifier of the target object; and

12 means for performing the I/O request on the target object at the determined first  
13 object identifier in the determined data store.

1        16.     The system of claim 15, wherein one workflow packet is associated with a  
2     plurality of the nodes in the workflow, and wherein the nodes submit I/O requests for one  
3     or more objects referenced by the second object identifiers in the workflow packet.

1        17.     The system of claim 15, wherein the data stores are capable of being  
2     different types of data stores and from different vendors

1        18.     The system of claim 15, further comprising:  
2              means for defining at least one work item for each node including a reference to  
3     the workflow packet, wherein the work item includes actions to perform with respect to  
4     at least one object in one data store referenced in the workflow packet; and  
5              means for receiving I/O requests from multiple nodes for objects referenced by  
6     second object identifiers in the workflow packet.

1        19.     The system of claim 15, wherein the I/O request comprises a workflow I/O  
2     request, wherein each data store is accessed using data store interfaces, further  
3     comprising:  
4              means for providing a mapping of workflow I/O requests to the data store  
5     interfaces for each of the data stores, wherein each workflow I/O request maps to one or  
6     more data store interfaces for each data store, wherein the data store interfaces implement  
7     the workflow I/O requests in the data store; and  
8              means for determining from the mapping the at least one data store interface for  
9     the determined data store that implements the workflow I/O request in the determined  
10   data store, wherein the workflow I/O request is performed using the determined at least  
11   one data store interface.

1        20.     The system of claim 19, wherein the data stores are capable of comprising  
2     different types of data stores from different vendors that utilize different sets of data store

3 interfaces to enable access to objects in the data stores, and wherein the mapping enables  
4 the workflow I/O requests to be executed across heterogeneous data stores.

1        21.     The system of claim 15, wherein the objects in the data store are capable  
2 of comprising documents, video files, audio files, and images.

1        22.     The system of claim 15, further comprising:  
2            means for receiving a request, from at least one node, to add one second object  
3 identifier to the workflow packet referencing one object in one of the data stores that is  
4 not already referenced in the workflow packet, wherein subsequent nodes in the workflow  
5 are capable of accessing the object referenced by the added second object identifier.

1        23.     The system of claim 15, further comprising:  
2            means for receiving a request, from at least one node, to remove one second  
3 object identifier in the workflow packet referencing one object in one of the data stores,  
4 wherein subsequent nodes in the workflow will not be capable of accessing the object  
5 referenced by the removed second object identifier.

1        24.     The system of claim 15, wherein the I/O request comprises a request to  
2 perform one of reading, writing or opening to the target object.

1        25.     An article of manufacture including code for implementing a workflow  
2 comprised of nodes by:  
3            generating a workflow packet accessed by users at the nodes in the workflow;  
4            receiving a request to add one target object in one of a plurality of data stores to  
5 the workflow packet, wherein each data store includes multiple objects;  
6            determining a first object identifier of the target object that is used to identify the  
7 target object in one data store;

8           generating a second object identifier indicating the data store including the target  
9   object and the first object identifier; and  
10          inserting the generated second object identifier into the workflow packet, where  
11   nodes accessing objects in the workflow packet use the second object identifier to access  
12   the target object for use at the node.

1           26.       The article of manufacture of claim 25, wherein the data stores are capable  
2   of being different types of data stores and from different vendors.

1           27.       An article of manufacture including code for performing an Input/Output  
2   (I/O) operation on an object during execution of a workflow comprised of nodes by:  
3            providing a plurality of objects stored in one of multiple data stores, wherein each  
4   object is identified within the data store with a first object identifier;  
5            providing a workflow packet referencing at least one object with a second object  
6   identifier, wherein the second object identifier indicates one of the data stores and the  
7   first object identifier of the referenced object in the data store;  
8            receiving, from one node, an I/O request for one target object referenced by one  
9   second object identifier in the workflow packet;  
10          determining from the second object identifier the data store of the target object  
11   and the first object identifier of the target object; and  
12          performing the I/O request on the target object at the determined first object  
13   identifier in the determined data store.

1           28.       The article of manufacture of claim 27, wherein one workflow packet is  
2   associated with a plurality of the nodes in the workflow, and wherein the nodes submit  
3   I/O requests for one or more objects referenced by the second object identifiers in the  
4   workflow packet.

1        29.     The article of manufacture of claim 27, wherein the data stores are capable  
2     of being different types of data stores and from different vendors

1        30.     The article of manufacture of claim 27, further comprising:  
2              defining at least one work item for each node including a reference to the  
3     workflow packet, wherein the work item includes actions to perform with respect to at  
4     least one object in one data store referenced in the workflow packet; and  
5              receiving I/O requests from multiple nodes for objects referenced by second object  
6     identifiers in the workflow packet.

1        31.     The article of manufacture of claim 27, wherein the I/O request comprises  
2     a workflow I/O request, wherein each data store is accessed using data store interfaces,  
3     further comprising:  
4              providing a mapping of workflow I/O requests to the data store interfaces for each  
5     of the data stores, wherein each workflow I/O request maps to one or more data store  
6     interfaces for each data store, wherein the data store interfaces implement the workflow  
7     I/O requests in the data store; and  
8              determining from the mapping the at least one data store interface for the  
9     determined data store that implements the workflow I/O request in the determined data  
10    store, wherein the workflow I/O request is performed using the determined at least one  
11    data store interface.

1        32.     The article of manufacture of claim 31, wherein the data stores are capable  
2     of comprising different types of data stores from different vendors that utilize different  
3     sets of data store interfaces to enable access to objects in the data stores, and wherein the  
4     mapping enables the workflow I/O requests to be executed across heterogeneous data  
5     stores.

1       33.     The article of manufacture of claim 27, wherein the objects in the data  
2 store are capable of comprising documents, video files, audio files, and images.

1       34.     The article of manufacture of claim 27, further comprising:  
2           receiving a request, from at least one node, to add one second object identifier to  
3 the workflow packet referencing one object in one of the data stores that is not already  
4 referenced in the workflow packet, wherein subsequent nodes in the workflow are  
5 capable of accessing the object referenced by the added second object identifier.

1       35.     The article of manufacture of claim 27, further comprising:  
2           receiving a request, from at least one node, to remove one second object identifier  
3 in the workflow packet referencing one object in one of the data stores, wherein  
4 subsequent nodes in the workflow will not be capable of accessing the object referenced  
5 by the removed second object identifier.

1       36.     The article of manufacture of claim 27, wherein the I/O request comprises  
2 a request to perform one of reading, writing or opening to the target object.